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## PATENT APPLICATION

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search report : *See end of this specification*

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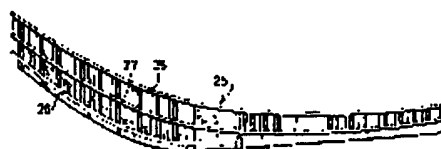
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### (54) REINFORCED STRUCTURAL MEMBER AND FABRICATION PROCESS

(57) Reinforced structural member formed by an outer hollow body (20) wherein the inside walls delineate a chamber for filling with a material such as foam, characterised in that the filling chamber (23) contains a ribbed internal element (25) which delineates foam-filled cavities (30) formed in contact with the internal element and limited by said inside walls (20i) of the outer element (20).



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**REINFORCED STRUCTURAL MEMBER AND FABRICATION  
PROCESS**

The invention relates to a reinforced structural member and its fabrication process.

More precisely, the invention relates to a reinforced structural member designed  
5 for use in road vehicles, wherein the internal walls of a hollow body delineate a chamber for filling with a material such as foam.

According to publication DE-U-1983413, a vehicle is known wherein the vehicle structure incorporates an energy-absorbing element extending over the width of the vehicle and which is formed by a hollow body that is U-shaped in cross-  
10 section and whose opposing limbs are aligned horizontally. The hollow body is filled with a plastic foam. However, this method of construction presents the drawback that the hollow body has only limited rigidity. The limbs of the hollow body thus formed warp under the effect of relatively small forces, so that its ability to absorb energy by deformation is insufficient.

15 Pursuant to these considerations, the object of the invention is to provide a reinforced structural member with a high degree of rigidity. Not only must its fabrication be simple, but it must also be possible to adapt the proposed reinforcement to different configurations of structural members having regard to their cross-section and location.

20 To achieve this objective, according to the invention, the filling chamber of the structural member contains a ribbed internal rigid element which delineates foam-filled cavities formed on contact with the internal element and limited by the walls of the outer element.

The invention has the advantage of being suitable for use with hollow bodies of  
25 limited strength forming part of a lightweight structure or chassis.

The invention also has the advantage that it is capable of being fitted to certain sections of the vehicle structure or chassis supporting the bodywork of said vehicle.

The principal advantage of the invention lies in the fact that a structural member  
5 and its filling provide a means of obtaining a force-transmitting element independently of the shape of the structural member. The structural member thus makes it possible to locally increase the rigidity of said structure.

Construction of the structural member is particularly simple and is realised simply by heating the internal element, causing a foam product to expand thereby  
10 encapsulating and immobilising said internal element and bonding the foam product to the inside walls of the outer element.

Other characteristics and advantages of the invention will become apparent in the course of the following description with reference to the attached drawing given solely by way of example, in which :

- 15 - figure 1 is a view in elevation of a road vehicle body whereon possible locations of the structural member according to the invention are shown by way of non-limitative example.
- figure 2 is a perspective view of the internal reinforcement.
- figures 3 and 4 are sectional views of the structural member on line IV-IV in  
20 figure 1 respectively before and after expansion of the foam material.

Figure 1 is a diagrammatic representation of the body 10 of a road vehicle mounted on a subframe 11. On the subframe 11, reference 12 designates the bottom rail of which the shaded sections 13 and 14 are, by way of non-limitative examples, composed of structural members according to the invention.

As illustrated in figure 3 or 4, a hollow outer element 20 is composed of a U-shaped section 21 of which the flanged top edges form a welding rim in contact with a closure plate 22.

The inside walls 20i of the element 20 delineate a filling chamber 28.

- 5 According to the invention, a reinforcing member composed of the ribbed element 25 carries the unexpanded foam product 24. The reinforcement 25 is inserted into the chamber 28 and is connected rigidly to the closure plate 22. The assembly thus formed is fitted together and welded, according to figure 4, to form a hollow body with the U-shaped section 21.
- 10 The assembly thus formed allows free passage 23 for pickling and surface treatment products before curing, and therefore permits self-cleaning of the inside wall 20i of the section 21.

- The reinforcement 25 consists of a profile made of heat-conducting material such as cast aluminium, magnesium, etc... of which the ribs 26, 27 and 35 are oriented
- 15 towards the inside wall 20i of the outer element 20. These ribs which delineate cavities 30 filled with foam facilitate the diffusion of heat when a heat source is applied to produce a temperature rise sufficient to cause the foam product to expand and bond to the inner wall 20i (figure 4) during treatment of the rail 12 and the reinforcement 25 during the passage of the vehicle assembly through
- 20 curing ovens.

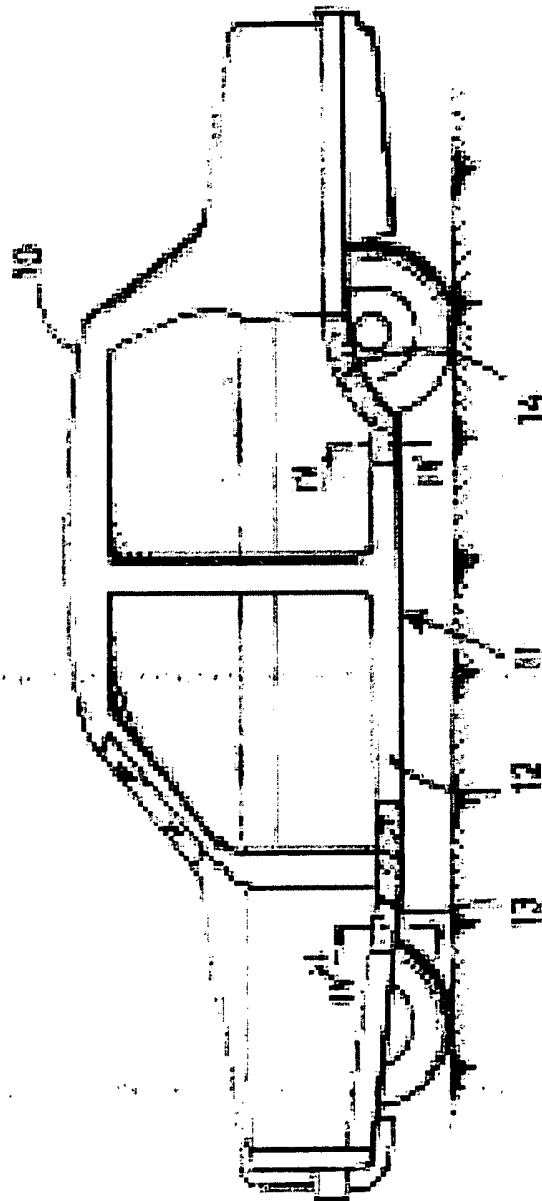
- The envisaged expansion of the foam substantially triples its initial volume. The reinforcement 25 ensures that sufficient heat energy is simultaneously applied to uniformly expand the foam product along the necessary portion of the section 21 and locally strengthen the latter by bonding the reinforcement 25 inside said
- 25 section 21 by means of the foam material.

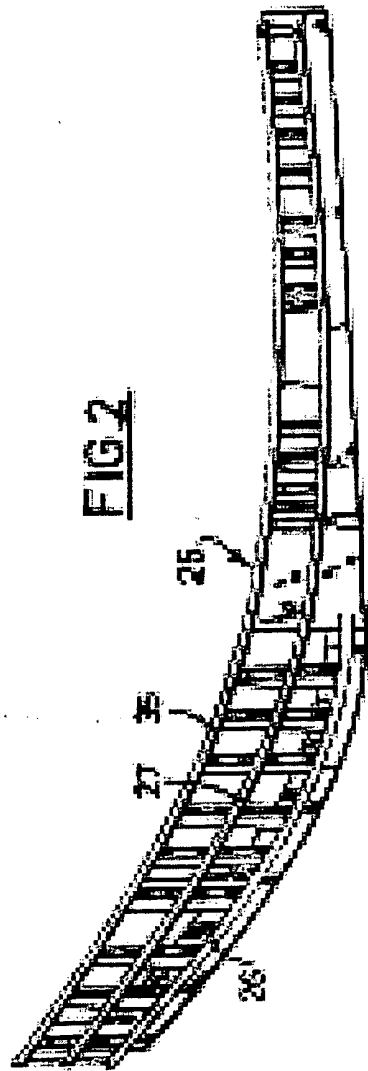
CLAIMS

- 5     1) Reinforced structural member formed by an outer hollow body (20) wherein  
the inside walls delineate a chamber for filling with a material such as foam,  
characterised in that the filling chamber (23) contains a ribbed internal  
element (25) which delineates foam-filled cavities (30) formed in contact with  
the internal element and limited by said inside walls (20i) of the outer element  
10     (20).
- 2) Structural member according to claim 1, characterised in that the internal  
element (25) incorporates ribs (26, 27, 35) oriented towards the inside walls  
(20i) of the outer element (20).
- 15     3) Structural member according to claim 2, characterised in that the ribs (26, 27,  
35) of the internal element (25) are carried on a strengthening element in cast  
aluminium.
- 20     4) Fabrication process for the reinforced structural member according to any of  
claims 1, 2 or 3, characterised in that a reinforcing member (25) carrying a  
foam product (24) is inserted into a filling chamber (28) allowing free passage  
for surface treatment products, and sufficient heat is applied to expand the  
foam product and bond it to the inner surfaces (20i) of the outer hollow body  
(20) as the vehicle assembly is passing through the curing ovens.

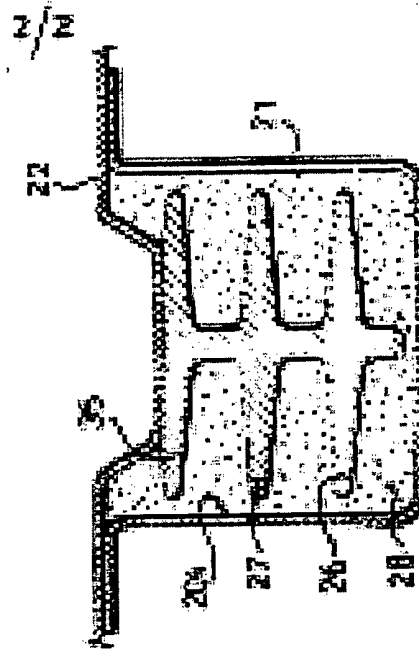
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FIG. 1

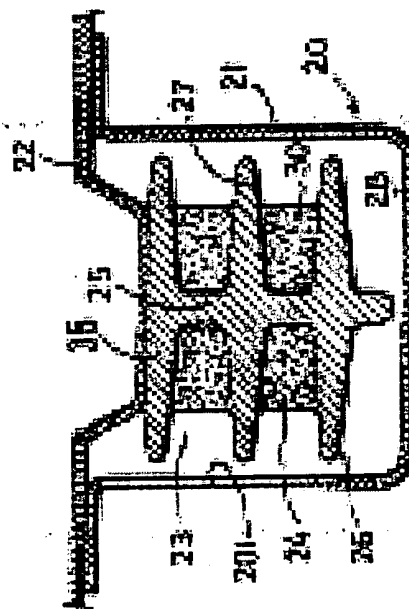




**FIG. 2**



**FIG. 4**



**FIG. 3**



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PRELIMINARY SEARCH  
REPORT

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number

NATIONAL INSTITUTE  
of  
INDUSTRIAL PROPERTY

prepared on the basis of the latest claims filed prior to  
commencement of the search

FA 528873  
FR 9606714

DOCUMENTS CONSIDERED PERTINENT		Claims concerned in the application examined
Category	Document reference and, where necessary, details of pertinent sections	
A	DE 42 03 460 A (VOLKSWAGENWERK AG) 27 August 1992 * the full document *	1, 3
X	---	4
A	WO 93 05103 A (HENKEL KGAA) 18 March 1993 * page 6, line 10 - line 25; figure 2 *	1
X	---	4
A	EP 0 383 498 A (EXXON CHEMICAL PATENTS INC) 22 August 1990 * the full document *	1
X	---	4
A	EP 0 039 071 A (SAURER AG ADOLPH) 4 November 1981 * page 8, line 32 - page 9, line 5; figure 3 *	1
A	US 4 014 587 A (EGGERT JR WALTER S) 29 March 1977 * abstract; figures *	1
		TECHNICAL FIELDS SEARCHED
		B62D
Date search completed 6 November 1996		Examiner Hageman, L
<p><b>CATEGORY OF DOCUMENTS CITED</b></p> <p>X : particularly pertinent in itself Y : particularly pertinent in conjunction with another document in the same category A : pertinent in respect of at least one claim or general technical background O : non-written disclosure P : intercalary document</p> <p>T : theory or principle on which the invention is based E : patent document predating the date of filing and published only at the date of filing or at a later date D : cited in the application L : cited for other reasons ..... &amp; : member of the same family, corresponding document</p>		